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ABSTRACT

This paper begins with an overview of several instruments for assessing the school environment, focusing on Moos's Work Environment Scale (WES). Although the WES was designed for use in any work milieu, its 10 dimensions of work environment (involvement, peer cohesion, staff support, autonomy, task orientation, work pressure, clarity, control, innovation, and physical comfort) seem well suited to describing salient features of the teacher's school environment. The second part of the paper considers the validity of the WES when used for the first time specifically with school teachers. For example, administration of a slightly reworded version to 114 science teachers in 35 high schools revealed KR-20 reliability coefficients ranging from 0.60 to 0.85. The WES has now been cross-validated with larger samples of elementary and high school teachers responding to both an actual form (N=599) and a preferred form (N=543). Data analyses attest to the internal consistency, reliability and discriminant validity of both WES forms. The third part of the paper considers applications of the WES in science education and, in particular, presents profiles depicting interesting differences in the environments of elementary schools and high schools. For example, high school teachers (compared to elementary teachers) characterized their school environments as involving less work pressure. (Author/JN)

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ASSESSMENT OF TEACHERS' PERCEPTIONS OF SCHOOL-LEVEL ENVIRONMENT

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ABSTRACT

Past work on psychosocial environments in science education can be divided usefully into research involving students' perceptions of their classroom-level environment and studies of teachers' perceptions of their school-level environment. This paper begins by overviewing several instruments for assessing school environment, giving particular attention to Moos's Work Environment Scale (WES). Although the WES was designed for use in any work milieu, its ten dimensions of work environment (Involvement, Peer Cohesion, Staff Support, Antonomy, Task Orientation, Work Pressure, Clarity, Control, Innovation, and Physical Comfort) seem quite well suited to describing salient features of the teacher's school environment. The second part of the paper considers the validity of the WES when used for the first time specifically with school teachers. For example, administration of a slightly reworded version to 114 science teachers in 35 high schools revealed KR-20 reliability coefficients ranging from 0.60 to 0.85. The WES has now been crossvalidated with a larger sample of elementary and high school teachers responding to both an actual form (N=599) and a preferred form (N=543). Analyses of these data attested to the internal consistency reliability and discriminant validity of both the actual and preferred form of the WES with either the individual teacher or the school mean as the unit of analysis; as well each scale in the actual form differentiated significantly between the perceptions of teachers in different schools. The third section of the paper considers applications of the WES in science education and, in particular, presents profiles depicting interesting differences in the environments of elementary and high schools. For example, in comparison with elementary school teachers, high school teachers perceived their school environments as being characterized by more work pressure, less clarity regarding school rules and policies, less innovation, and worse physical surroundings.

An important distinction can be drawn between school-level and classroom-level environment (Fraser and Rentoul, 1982; Genn, 1984). For example, whereas classroom climate might involve relationships between teachers and their students or among students, school climate might involve a teacher's relationships with other teachers, senior staff, and the school principal. Student perceptions are used frequently to measure classroom environment, but they are used seldom in measuring school climate because it is felt that students could be unaware of many aspects of the school-level environment. The school environment also can be considered more global than the classroom environment. Furthermore, classroom-level environment research has been based on different theoretical and conceptual foundations from school-level environment research. The theoretical underpinnings of classroom environment research are described in recent reviews (e.g., Moos, 1979; Walberg, 1979; Fraser, 1981a, 1985, 1986; Chavez, 1984), whereas school environment research has tended to be associated with the field of educational administration and rests on the assumption that schools can be viewed as formal organizations (Thomas, 1976; Anderson, 1982).

Science education researchers internationally have paid substantial attention to studies involving students' perceptions of classroom-level environment (Fraser and Walberg, 1981). In contrast, research on teachers' perceptions of school-level environment has received scant attention from science education researchers. Consequently, in order to provide a basis for the beginnings of a tradition of school environment research in science education, the present paper has as one of its major aims the provision of a general overview of existing instruments measuring school environment. A second major aim is to report the first uses of an instrument called the Work Environment Scale (WES) specifically for the purpose of measuring teachers' perceptions of their school environment.

MEASURING HUMAN ENVIRONMENTS

Three characteristic methods for conceptualizing and measuring human environments have been delineated by Moos (Insel and Moos, 1974; Moos, 1974). These are dimensions of organizational structure (in which behavior in an environment is influenced by structural dimensions such as size of school, staffing ratios, etc.), personal characteristics of milieu inhabitants (in which the characteristics of the environment are assumed to depend on the nature of its members' personalities, intelligence levels, etc.), and psychosocial characteristics and organizational climate (which involves both psychological and social dimensions of an environment, as perceived by insiders or outsiders, in a framework of person-milieu interaction). It is this third approach to measuring environments that is made use of in the WES.

Moos (1974) has found that the same three general categories can be used in conceptualizing the individual dimensions characterizing diverse psychosocial environments. This finding has emerged from Moos's work in a variety of environments including hospital wards, school classrooms, prisons, military companies, university residences, and work milieus. The three basic types of dimensions are: Relationship Dimensions (e.g., support, involvement) which identify the nature and intensity of personal relationships within the environment and assess the extent to which people are involved in the environment and the extent to which they

support and help each other; Personal Development Dimensions (e.g., autonomy, competition) which assess the basic directions along which personal growth and self-enhancement tend to occur; and System Maintenance and System Change Dimensions (e.g., innovation, clarity, work pressure) which involve the extent to which the environment is orderly, clear in expectations, maintains control, and is responsive to change.

An important conclusion reached by Moos (1974) is that, at minimum, all three dimensions must be assessed to provide an adequate and reasonably complete picture of any environment; this was taken cognizance of in the initial development of the WES. In the next section's review of existing instruments measuring perceptions of psychosocial characteristics of school environments, an attempt is made to show how the scales contained in several existing instruments can be classified according to Moos's scheme.

INSTRUMENTS FOR ASSESSING SCHOOL ENVIRONMENT

Coughlan (1966, 1969) developed a 120-item instrument called the School Survey to measure teachers' perceptions of or attitudes to 14 dimensions of school environment (Administrative Practices, Professional Work Load, Nonprofessional Work Load, Materials and Equipment, Buildings and Facilities, Educational Effectiveness, Evaluation of Students, Special Services, School-Community Relations, Supervisory Relations, Colleague Relations, Voice in Educational Program, Performance and Development, Financial Incentives). KR-20 reliability estimates for the different scales, which vary in length from six to 10 items, ranged from 0.44 to 0.80 with a median of 0.67. Some examples of recent studies which made use of the School Survey to measure school environment are Ellett, Masters, and Pool (1978) and Perkins (1978).

Hoyle (1976) has developed the Learning Climate Inventory (LCI) to measure teachers' perceptions of five dimensions of school environment at the primary or secondary school level. The LCI's five factor-analytic scales, which are called Leadership, Freedom, Evaluation, Compliance, and Cooperation, measure dimensions that are especially salient in open schools. Based on six samples of U.S. teachers varying in size from 34 to 100, alpha reliabilities of LCI scales were found to range from 0.50 to 0.72 and test-retest reliabilities were found to range from 0.75 to 0.92. Furthermore, the use of the LCI in a study comparing the environment of open-space and traditional schools revealed significant differences between teachers' perceptions in the two types of schools (Hoyle, 1973).

Pace and Stern (1958) developed the College Characteristics Index (CCI) to measure student or staff perceptions of 30 environment characteristics of college or universities. Each of these 30 variables (e.g., Affiliation, Aggression, Deference, Impulsiveness, Order) was based on Murray's (1938) taxonomy and paralleled a needs scale in Stern, Stein, and Bloom's (1956) Activities Index. That is, each Activities Index scale corresponded to behavioral manifestations of a needs variable, while the parallel CCI scale corresponded to environmental press conditions likely to facilitate or impede their expression. Stern (1970) reported that CCI scale reliabilities (KR-20 coefficients) ranged from 0.40 to 0.78 with a mean of 0.65 for a sample of 4,196 students and staff in 51 institutions in the U.S.

The original CCI has been adapted by Stern (1961) to form the High School Characteristics Index (HSCI), which is suitable for use at the Grade 9 to 12 levels. When the HSCI was administered to 947 high school students from 12 widely scattered schools in the U.S., Stern (1970) found that scale reliabilities (KR-20 estimates) ranged from 0.28 to 0.77 and that each scale differentiated significantly ($p<0.001$) between the perceptions of students in different classrooms. Also factor analysis of the 30 HSCI scales for the same sample revealed that the following seven factors accounted for 59 per cent of the variance: Intellectual Climate, Expressiveness, Group Life, Personal Dignity, Achievement Standards, Orderliness, and Practicalness. An example of a study employing the HSCI in science education research is Gardner (1976).

McDill, Rigsby, and Meyers (1969) employed scales derived from a factor analysis of items based in part on the CCI and HSCI in exploring environment-achievement relationships. The large sample which provided their perceptions of school environment consisted of 20,345 students and 1,029 teachers in a national U.S. sample of 20 high schools. Factor analysis revealed that 80 per cent of the variance could be explained by the following six factors: Academic Emulation, Student Perception of Intellectualism-Estheticism, Cohesive and Egalitarian Estheticism, Scientism, Humanistic Excellence, and Academically Oriented Student Status System. Multiple regression analyses revealed that, with father's education, student academic values, and student ability held constant, each of the six environment scales was significantly related to mathematics achievement, and five of the climate scales (with the exception of Scientism) was significantly related to college plans.

Two further instruments measure learning environment perceptions at the whole college level (as distinct from the college class level); however, these have not yet been adapted for school use. These are Pace's (1969) College and University Environment Scales (CUES) and Peterson, Centra, Hartnett, and Linn's (1970) Institutional Functioning Inventory (IFI). The CUES measures the variables of Community, Campus Morale, Faculty-student Relationship, (Relationship Dimensions in Moos's scheme), Awareness, Scholarship (Personal Development Dimensions), Practicality, and Propriety (System Maintenance and System Change Dimensions). The scales contained in the IFI are Institutional Esprit (Relationship Dimension), Intellectual-aesthetic Extracurriculum, Concern for Improvement of Society, Concern for Undergraduate Learning, Concern for Advancing Knowledge, Concern for Meeting Local Needs (Personal Development Dimensions), Freedom, Democratic Governance, Self-study and Planning, Concern for Innovation, and Human Diversity (System Maintenance and System Change Dimensions).

The School-Level Environment Questionnaire (SLEQ) (Fraser and Rentoul, 1982; Rentoul and Fraser, 1983) assesses teachers' perceptions of eight dimensions of school environment. The SLEQ consists of two Relationship Dimensions (Affiliation and Student Supportiveness), two Personal Development Dimensions (Professional Interest and Achievement Orientation), and four System Maintenance and System Change Dimensions (Formalization, Centralization, Innovativeness, and Resource Adequacy). Each SLEQ scale contains seven items of five-point response format. For a sample of 83 teachers in Sydney, Australia, alpha reliability coefficients for SLEQ scales were found to be 0.87 for Affiliation, 0.70

for Student Supportiveness, 0.86 for Professional Interest, 0.91 for Achievement Orientation, 0.73 for Formalization, 0.80 for Centralization, 0.84 for Innovativeness, and 0.81 for Resource Adequacy. Mean correlations of a scale with the other scales for this sample ranged from 0.17 to 0.38. Use of the SLEQ and a classroom environment instrument together within the one study revealed some interesting associations between school-level and classroom-level environment (e.g., greater formalization in the school environment was linked with lower levels of classroom Participation, Independence, and Differentiation) and attested to the potential usefulness of combining classroom-level and school-level environment instruments in the same study (Fraser and Rentoul, 1982).

In some collaborative work involving the University of Houston and the Houston Independent School District, Pyper et al. (1981) developed an instrument to assess seven dimensions of school climate among either teachers, parents, or students. The name of the seven scales are Leadership Qualities of Principal, Teacher-Peer Relations, Parent-Teacher Relations, Student-Teacher Interpersonal Relations, Student-Teacher Instructional Related Interactions, School Buildings and Facilities, and Student-Peer Relations. The items used in the parent and student versions were similar but not identical to the teacher version, and different subsets of the seven scales were answered by teachers, parents, and students. The instrument was administered in two different years to combined samples of 70 classes in four schools, to teachers of these classes, and to 650 parents. Scale alpha realities were calculated separately for each of the two years and were found to range from 0.55 to 0.85 for teachers, from 0.62 to 0.79 for parents, and from 0.31 to 0.75 for students when estimates were made separately for elementary, junior high, and high school classes.

The Quality of School Life (QSL) scale (Epstein and McPartland, 1976; Epstein, 1981) contains 27 items which assess satisfaction with school in general, commitment to school work, and reactions to teachers (i.e., the nature of student-teacher relationships). When this instrument was administered to 4,266 students in both elementary and secondary schools in Maryland, KR-20 reliabilities ranged from 0.64 to 0.81 for different scales when estimated separately for elementary and secondary students.

Brookover reported a study in which perceptions of school environment were related to student achievement (Brookover and Schweitzer, 1975; Brookover et al, 1978). The sample consisted of 8,078 fourth and fifth grade students, 327 teachers, and 68 principals in a random sample of schools in Michigan. Brookover's instrument measures student perceptions of five dimensions (Sense of Academic Futility, Future Evaluations and Expectations, Present Evaluations and Expectations, Teacher Push and Teacher Norms, Academic Norms), teacher perceptions of five dimensions (Ability, Evaluations, Expectations and Quality of Education/College, Present Evaluations and Expectations for High School Completion, Teacher-Student Commitment to Improve, Principal's Expectations, Academic Futility), and principal perceptions of four dimensions (Parent Concern and Expectations for Quality Education, Efforts to Improve, Principal and Parent Evaluation of Present School Quality, Present Evaluations and Expectations of Students). Simple correlational analysis with the school mean as the unit of

analysis revealed that the magnitude of the simple correlation between achievement and an environment scale ranged from 0.01 to 0.77. In particular, student sense of Academic Futility was found to have the largest correlation with achievement. Multiple regression analyses with the school as the unit of analysis revealed that the amount of achievement variance accounted for by the set of 14 school environment variables before and after socioeconomic status and the ratio of white to black students were controlled was 73 and four per cent, respectively.

Probably the most widely used instrument measuring school environment is Halpin and Croft's (1963) Organizational Climate Description Questionnaire (OCDQ). In fact, Thomas (1976) has noted that the OCDQ has been used in over 200 studies in at least eight different countries and that the instrument achieved something of bandwagon status in research in the field of educational administration. The final version of the OCDQ contains 64 items of four-point response format which measure teacher perceptions of eight factor-analytically derived dimensions. Four of these dimensions pertain to teachers' behavior and are called Disengagement, Hindrance, Esprit (i.e., morale), and Intimacy, while the other four dimensions pertain to the principal's behavior and are called Aloofness, Production Emphasis, Thrust, and Consideration. Furthermore, Halpin and Croft have suggested a method by which profiles of OCDQ scores can be used to classify schools into six climate types: open, autonomous, controlled, familiar, paternal, and closed. Also, in terms of Moos's three general categories, the Disengagement, Esprit, Intimacy, and Consideration scales are classifiable as Personal Development Dimensions, the Hindrance and Thrust scales are classifiable as Personal Development Dimensions, and the Aloofness and Production Emphasis scales are classifiable as System Maintenance and System Change Dimensions. Although the OCDQ was designed initially for use in elementary schools, it has been used in numerous studies at the secondary school level.

The OCDQ formed the basis for the development of some new factor-analytic school environment scales by Finlayson (1973) in England and Deer (1980) in Australia for use in secondary schools. For example, Deer's instrument has two scales measuring student perception of teachers and other students (Teacher and Peer Concern for Students, Teacher and Peer Control of Students), four scales measuring teacher perceptions of the teacher group (Job Orientation, School Organization, Personal Relations, Communication), three scales measuring teacher perceptions of head of department behavior (Participatory Management, Awareness, Professional Concern for Staff), and four scales measuring teacher perceptions of the school principal's behavior (Participatory Management, Sensitivity, Professional Consideration for Staff, Personal Consideration for Staff). Administration of these scales to a sample of 1,457 ninth grade students and 359 teachers in 10 coeducational government secondary schools in New South Wales revealed that alpha reliability coefficients for the 13 scales ranged from 0.71 to 0.92.

DESCRIPTION OF WES

The instrument used in the present research was the Work Environment Scale (WES; Moos, 1981). Although the WES was designed for use in any work milieu, its 10 dimensions of work environment seem quite well suited

to describing salient features of the science teacher's school environment. The 10 scales in the WES consist of three measuring Relationship Dimensions (Involvement, Peer Cohesion, Staff Support), two measuring Personal Development Dimensions (Autonomy, Task Orientation), and five measuring System Maintenance and System Change Dimensions (Work Pressure, Clarity, Control, Innovation, Physical Comfort). The WES consists of 90 items of True/False response format, with an equal number of items in each of the 10 scales. Although the WES has been used in a variety of work milieus, it appears that this paper reports the first uses of the instrument in measuring teachers' perceptions of school environment. The WES is described in more detail in Table 1 which provides a scale description and sample item for each scale and shows each scale's classification according to Moos's scheme.

In addition to an actual form (or "real" form in Moos's terminology), which assesses perceptions of what a work environment is actually like, the WES also has a preferred (or "ideal") form. The preferred form is concerned with goals and value orientations and meaures perceptions of the work environment ideally liked or preferred. Item wording is almost identical in the actual and preferred forms except that an item such as "Activities are well planned" in the actual form would be changed to "Activities would be well planned" in the preferred form. Having separate actual and preferred forms of this school-level environment instrument would enable several interesting research applications analogous to those completed using classroom-level environment scales (see Fraser, 1985). These could include investigations of differences between actual and preferred school environments, person-environment fit studies of whether teachers or students function better in their preferred school environment, and practical attempts to improve school environments in ways which make them more congruent with teacher preferences.

In order to make the WES readily accessible to science teachers and science education researchers, Appendix A provides a complete copy of the actual form of the modified version of the WES. Items in Appendix A are arranged in cyclic order so that the first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, and tenth item in each block assesses, respectively, Involvement, Peer Cohesion, Staff Support, Autonomy, Task Orientation, Work Pressure, Clarity, Control, Innovation, and Physical Comfort. Items whose item numbers are underlined are scored 1 for True and 3 for False. The remaining items are scored in the reverse manner. Omitted or invalid responses are scored 2.

In the initial development of WES scales, Moos (1981) used several methods to gain a naturalistic understanding of the social environments of work groups and to obtain an initial pool of questionnaire items. For example, individuals were interviewed with regard to the characteristics of their work groups. Also, a wide variety of different people was involved in drafting initial versions of items.

Since the environment described in the original form of the WES is that of any work milieu, there was scope in the present studies to improve the instrument's face validity for use specifically in measuring science teachers' perceptions of their school environment. For this reason, the present investigations made use of a version of the WES in which the word "people" was changed to "teachers", the word "supervisor"

TABLE 1. Description of Scales in the WES and their Classification According to Moos's Scheme

Scale name	Description of scale	Sample item	Moos's General Category
Involvement	The extent to which teachers are concerned and committed to their jobs	Teachers put quite a lot of effort into what they do. (+)	Relationship
Peer Cohesion	The extent to which teachers are friendly and supportive of each other	Teachers go out of their way to help a new teacher feel comfortable. (+)	Relationship
Staff Support	The extent to which the senior staff is supportive of teachers and encourages teachers to be supportive of each other	Senior masters often criticize teachers over minor things. (-)	Relationship
Autonomy	The extent to which teachers are encouraged to be self-sufficient and to make their own decisions	Teachers can use their own initiative to do things. (+)	Personal Development
Task Orientation	The extent of emphasis on planning and efficiency	There is a lot of time wasted because of inefficiencies. (-)	Personal Development
Work Pressure	The extent to which the press of work dominates the job milieu	It is very hard to keep up with your work load. (+)	System Maintenance
Clarity	The extent to which teachers know what to expect in their daily routines and how explicitly school rules and policies are communicated	Teachers are often confused about exactly what they are supposed to do. (-)	System Maintenance

Cont....

TABLE 1. Description of Scales in the WES and their Classification According to Moos's Scheme

Scale name	Description of scale	Sample item		Moos's General Category
Control	The extent to which the school administration uses rules and pressures to keep teachers under control	Teachers are expected to conform rather strictly to the rules and customs.	(+)	System Maintenance
Innovation	The extent to which variety, change, and new approaches are emphasized in the school	This place would be one of the first to try out a new idea.	(+)	System Maintenance
Physical Comfort	The extent to which the physical surroundings contribute to a pleasant work environment	The colors and decorations make the place warm and cheerful to work in.	(+)	System Maintenance

Items designated (+) are scored by alloting 3 and 1, respectively, for the responses of True and False.
Items designated (-) are scored in the reverse manner. Omitted or invalid responses are scored 2.

was changed to "senior staff" and the word "employee" was changed to "teacher".

VALIDATION OF WES

Moos (1981) has reported validation data for the original form of the WES based on its administration to a sample of 624 employees and supervisors in a broad range of work groups (e.g., salesmen, nurses, drivers, maintenance workers) in the U.S. In particular, it was found that the internal consistency reliability (alpha coefficients) for various scales ranged from 0.70 to 0.91 and that the magnitude of the scale intercorrelations (which can be used as an index of discriminant validity) ranged from 0.05 to 0.59. Table 2 summarizes Moos's (1981) results for the sample of 624 people for each scale's internal consistency (alpha reliability coefficient) and the discriminant validity (using the convenient index of the mean correlation of a scale with the other nine scales).

The WES was used for the first time specifically with school teachers in a study conducted among Australian science teachers (Fisher and Fraser, 1983). The slightly modified version of the WES was administered to a sample of 114 science teachers in 35 secondary schools in Tasmania. This sample provided representative coverage of male and female teachers, of teachers with varying amounts of teaching experience, of teachers in state government schools and independent schools, and of schools in city and country areas. Data from this sample of science teachers were analysed to provide estimates of each scale's internal consistency (alpha coefficients) and discriminant validity (mean correlations of a scale with the other nine scales). Table 2 shows that the KR-20 coefficients for the different WES scales ranged from 0.60 to 0.85 for the science teacher sample. These figures are generally only a little lower than Moos's estimates shown in the same table. The magnitudes of the mean correlation of a scale with the other nine scales ranged from 0.16 to 0.41 for the sample of science teachers. These values are a little lower than those (namely, 0.18 to 0.57) obtained by Moos, and therefore suggest better discriminant validity. Overall the data in Table 2 indicate that the WES scales display satisfactory internal consistency and measure distinct, although somewhat overlapping, aspects of school environment.

Crossvalidation data are now available for the WES to support the promising validation information obtained for the sample of science teachers. The new sample was broader than the previous one in that it covered independent as well as government schools and it included elementary schools (Grades K-6), high schools (Grades 7-10), district high schools (Grades K-10), and secondary colleges (Grades 11-12). Whereas the previous study involved only the actual form of the WES, the new sample responded to both the actual form (what the environment is actually like) and the preferred form (what teachers would prefer the environment to be like). Table 3 describes this sample in terms of the number of schools and teachers involved from each school type. The total sample consisted of 34 schools, with 599 teachers responding to the actual form of the WES and 543 teachers responding to the preferred form. Both science and non-science teachers were included in this sample. These data were collected during an evaluation of teacher professional development activities in Tasmania in 1984 (Docker, Fisher and Hughes 1985).

TABLE 2. Internal Consistency (Alpha Reliability) and Discriminant Validity (Mean Correlation with Other Scales) for Actual and Preferred Forms of WES for Two Units of Analysis

Scale	Unit of Analysis	Alpha Reliability				Mean Correlation with Other Scales			
		Moos Sample	Science Teachers	New Sample	New Sample	Moos Sample	Science Teachers	New Sample	New Sample
		Actual	Actual	Actual	Pref.	Actual	Actual	Actual	Pref.
Involvement	Indiv	0.85	0.85	0.76	0.74	0.40	0.41	0.35	0.41
	School			0.93	0.91			0.48	0.50
Peer Cohesion	Indiv	0.70	0.60	0.72	0.69	0.37	0.33	0.31	0.39
	School			0.95	0.90			0.46	0.54
Staff Support	Indiv	0.78	0.66	0.71	0.68	0.25	0.29	0.30	0.36
	School			0.96	0.93			0.46	0.50
Autonomy	Indiv	0.76	0.61	0.60	0.55	0.35	0.27	0.32	0.33
	School			0.88	0.87			0.48	0.49
Task Orientation	Indiv	0.78	0.78	0.70	0.60	0.31	0.34	0.33	0.34
	School			0.97	0.91			0.49	0.49
Work Pressure	Indiv	0.84	0.74	0.79	0.70	0.21	0.16	0.11	0.28
	School			0.96	0.95			0.27	0.38
Clarity	Indiv	0.82	0.73	0.70	0.72	0.57	0.33	0.30	0.41
	School			0.90	0.95			0.41	0.54
Control	Indiv	0.77	0.64	0.64	0.62	0.18	0.18	0.17	0.11
	School			0.91	0.90			0.29	0.27
Innovation	Indiv	0.91	0.84	0.84	0.74	0.34	0.29	0.29	0.35
	School			0.98	0.95			0.44	0.47
Physical Comfort	Indiv	0.83	0.70	0.71	0.72	0.24	0.26	0.23	0.36
	School			0.93	0.94			0.38	0.45
Sample Sizes	Indiv	624	114	599	543	624	114	599	543
	School			34	34			34	34

Table 2 reports internal consistency and discriminant validity statistics for the new sample for both the actual and preferred form of the WES. Also, because some applications of the WES are likely to involve the school mean rather than the individual teacher as the unit of analysis, internal consistency and discriminant validity data are reported separately for the individual and the school mean as the unit of analysis. It is noteworthy from Table 2 that the reliability for school means typically is greater than 0.9 for both the actual and preferred forms of WES scales. Overall the data in Table 2 compare favorably with those obtained with the previous samples and attest to the internal consistency and discriminant validity of the WES in either its actual and preferred forms and with either the individual teacher or the class mean as the unit of analysis.

Another desirable characteristic of the actual form of a school environment instrument is that it is capable of differentiating between the perceptions of teachers in different schools. That is, teachers within the same school should perceive it relatively similarly, while mean within-school perceptions should vary from school to school. This characteristic was explored for each scale of the WES's actual form for the new sample of 599 teachers in 34 schools. A one-way ANOVA was performed for each scale, with school membership as the main effect. Table 4 shows that each scale differentiated significantly ($p<0.001$) between schools and that the eta^2 statistic (an estimate of the proportion of variance in WES scores attributable to school membership) ranged from 0.18 for Autonomy to 0.40 for Innovation or Physical Comfort.

USES OF WES

The WES appears to have possibilities as an instrument which can be used by science teachers and science education researchers to measure and describe school environments. Such assessments could form the basis of studies of the effects of the school environment on such outcomes as teacher job satisfaction or student achievement or morale. Also investigations might be made of links between school-level and classroom-level environment (see Fraser and Rentoul, 1982). Furthermore, it is conceivable that science teachers might use assessments of their perceptions of actual and preferred school environment as a basis for discussion of improvements in their school environments which would reduce actual-preferred discrepancies (see Moos, 1981; Fraser, 1981b; Fraser & Fisher, 1986).

One interesting question which can be explored with the available WES data is that of differences between school types. When profiles of WES scale means were sketched for the various school types listed in Table 3, reasonable similarity was found for preferred environment scales. That is, there was a fair degree of agreement among teachers in different types of schools as to what they would prefer their school environments to be like. In contrast, teachers' perceptions of their actual school environments varied markedly with school type. In particular, some appreciable differences were apparent between elementary schools and high schools in terms of actual school environment. Figure 1 illustrates these differences between the profiles of mean actual environment scores for government elementary schools (108 teachers in 9 schools) and government high schools (147 teachers in 7 schools).

TABLE 3. Number of Teachers in each Type of School

School Type	Number of Schools	Number of Teachers	
		Actual	Preferred
Government Schools			
Elementary (K-6)	9	108	107
High (7-10)	7	147	121
District (K-10)	6	108	99
Secondary College (11-12)	6	138	116
Independent Schools			
Primary (K-6)	2	22	22
Secondary (7-12)	4	76	78
Totals	34	599	543

TABLE 4. ANOVA Results for School Membership Differences in Teacher Perceptions on Actual Form of WES

Scale	SS Between	SS Within	df	F	Eta^2
Involvement	3216.5	8407.9	33, 565	6.6*	0.28
Peer Cohesion	2815.5	9400.9	33, 565	5.1*	0.23
Staff Support	1869.3	7410.6	33, 565	4.3*	0.20
Autonomy	1323.8	5848.9	33, 565	3.9*	0.18
Task Orientation	1687.9	6840.5	33, 565	4.2*	0.20
Work Pressure	4200.8	10743.6	33, 565	6.7*	0.28
Clarity	2862.9	9026.8	33, 565	5.4*	0.24
Control	3684.1	6713.3	33, 565	9.4*	0.35
Innovation	7559.5	11535.4	33, 565	11.2*	0.40
Physical Comfort	5470.9	8312.3	33, 565	11.3*	0.40

* $p<0.001$

Differences between elementary and high schools were tested statistically for each WES scale. The first step involved the performance of a one-way MANOVA in which the set of 10 environment scales constituted the dependent variables and the type of school (high vs. elementary) constituted the main effect. Because the multivariate test using Wilk's lambda criterion was statistically significant ($p<0.01$), the univariate ANOVA results were examined for each of the 10 scales individually. Differences were nonsignificant ($p<0.05$) only for the Control scale. In the remaining nine scales, differences were statistically significant at the 0.01 level of confidence.

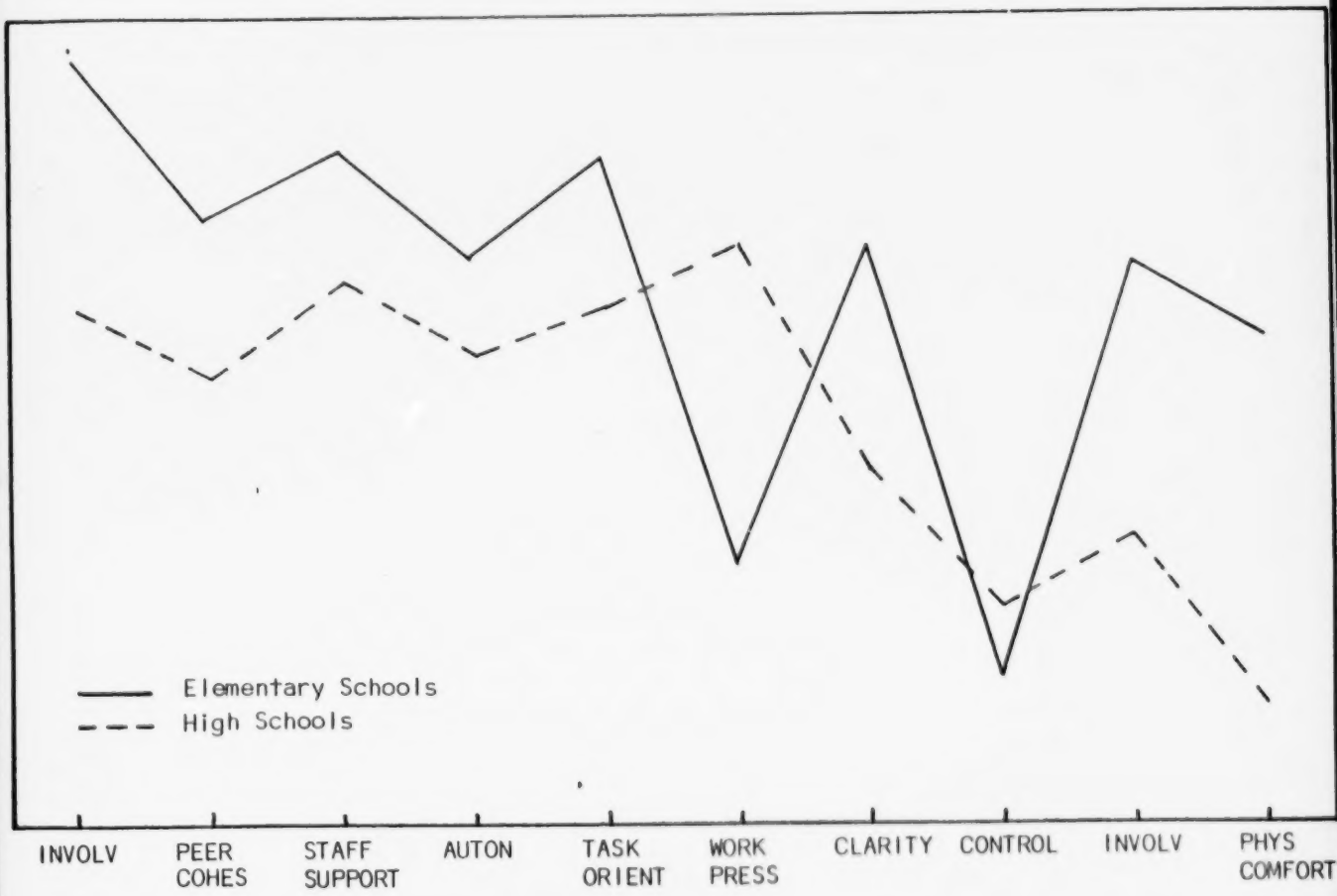
Figure 1 clearly illustrates that elementary school teachers perceived a more favorable school environment than high school teachers on all nine dimensions for which significant differences emerged. That is, relative to high school teachers, elementary school teachers perceived their schools as having greater Involvement, Peer Cohesion, Staff Support, Autonomy, Task Orientation, Clarity, Innovation, and Physical Comfort and less Work Pressure. These differences appear greatest in what Moos refers to as System Maintenance and System Change Dimensions. In comparison with elementary teachers, these high school teachers perceived the school environment as being characterized by more work pressure, less clarity regarding school rules and policies, less innovation, and worse physical surroundings. While caution is needed before generalizing the results for this particular sample of schools, the findings are interesting and suggest the desirability of future work along these lines.

Docker, Fisher, and Hughes (1985) attempted to link school staff development practices with school environment characteristics for the sample described in Table 3. Schools with better work environments also were found to have better staff development practices (especially in terms of having a whole-school philosophy of staff development, a principal willing to take a leadership role, and provision of resources to support staff development).

Whereas several science education studies (e.g., Anderson, Walberg, and Welch, 1969; Fraser, 1979) have made use of classroom-level environment instruments as sources of criteria of effectiveness in educational program evaluation, no known study in science education has used a school-level environment instrument for analogous evaluation purposes. The potential usefulness of school-level environment scales in evaluation research in science teaching is suggested by promising studies among non-science teachers involving use of school environment measures in evaluating alternative high schools (Williamson, Tobin, and Fraser, 1986), principals' leadership training workshops (DePiano, 1980), and some teachers' inservice workshops (McClure, Pratola, Ellis, Fitzritson, McCammon, and Felder, 1980).

Thomas (1976, p. 441) noted that "organizational climate is an elusive and tangible concept and yet it is one which may offer the educationist a means of better understanding the operation of schools." Stewart (1979) suggests that, by attempting to regulate the school environment, it is possible for educators to improve the learning and social development of students. Such regulation of the school environment could be facilitated by using such instruments as the WES to measure and describe environments.

Fig 1. Differences between elementary schools and high schools on the WES



CONCLUSION

This paper has described the first use of the Work Environment Scale (WES) to measure teachers' perceptions of 10 important psychosocial dimensions of their school environment. Noteworthy features of this instrument include its adequate coverage of Moos's three general categories for conceptualizing all human environments, and its face validity for use in schools, and its economy (in that teachers take only 10 to 15 minutes to respond to all 10 scales). Administration of the WES to samples of both science and non-science teachers has attested to each scale's internal consistency and discriminant validity in either its actual or preferred forms and with either the individual teacher or the class mean as the unit of analysis. Also the actual form of each scale was found to differentiate between the perceptions of teachers in different schools.

The paper also reported an application of the WES in which elementary schools were found to have a more favorable school environment than high schools especially in terms of clarity of school rules, amount of innovation, physical surroundings, and work pressure. It is hoped that science education researchers and science teachers will make use of this widely applicable and extensively validated instrument in assessing the important concept of school environment and in pursuing the research and practical applications suggested in this paper.

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Appendix A

SCHOOL CLIMATE SURVEY

ACTUAL FORM

Instructions

There are 90 statements in this questionnaire. They are statements about the school in which you work.

You are to describe how well each statement describes what the school in which you work is actually like.

Find the number on the separate Response Sheet which corresponds to the statement you are considering. On your Response Sheet, put a circle around:

TRUE if you think the statement is <u>true</u> or <u>mostly true</u> in relation to your school

FALSE if you think the statement is <u>false</u> or <u>mostly false</u> in relation to your school

If you change your mind about an answer, cross out the old answer and circle the new one.

Please answer every statement.

1. The work is really challenging.
2. Teachers go out of their way to help a new teacher feel comfortable.
3. Senior staff tend to talk down to teachers.
4. Few teachers have any important responsibilities.
5. Teachers pay a lot of attention to getting work done.
6. There is constant pressure to keep working.
7. Things are sometimes pretty disorganized.
8. There is a strict emphasis on following policies and regulations.
9. Doing things in a different way is valued.
10. The school sometimes gets too hot.

11. There's not much group spirit among teachers.
12. The atmosphere in the school is somewhat impersonal.
13. In general, senior staff usually compliment a teacher who does something well.
14. Teachers have a great deal of freedom to do as they like.
15. There is a lot of time wasted because of inefficiences.
16. There always seems to be an urgency about everything.
17. Activities are well planned.
18. Teachers can wear any type of clothing they want.
19. New and different ideas are always being tried out.
20. The lighting is extremely good.

21. A lot of teachers seem to be just putting in time.
22. Teachers take a personal interest in each other.
23. In general, senior staff tend to discourage criticisms from teachers.
24. Teachers are encouraged to make their own decisions.
25. At this school things rarely get 'put off until tomorrow'.
26. Teachers cannot afford to relax.
27. Rules and regulations are somewhat vague and ambiguous.
28. Teachers are expected to follow set rules in doing their work.
29. This school would be one of the first to try out a new idea.
30. Work space is awfully crowded.

31. Teachers seem to take pride in the school.
32. Teachers rarely do things together after school.
33. Senior staff usually give full credit to ideas contributed by teachers.
34. Teachers can use their own initiative to do things.
35. This is a highly efficient, work-oriented school.
36. The staff does not work too hard.
37. The responsibilities of senior masters are clearly defined.
38. Senior staff keep a rather close watch on teachers.
39. Variety and change are not particularly important.
40. This school has a stylish and modern appearance.

41. Teachers put quite a lot of effort into what they do.
42. Teachers are generally frank about how they feel.
43. Senior staff often criticize teachers over minor things.
44. Senior staff encourage teachers to rely on themselves when a problem arises.
45. Getting a lot of work well done is important to teachers.
46. There is no pressure on time.
47. The details of assigned jobs are generally explained to teachers.
48. Rules and regulations are pretty well enforced.
49. The same teaching methods have been used for quite a long time.
50. The school could stand some new interior decorations.

51. Few teachers ever volunteer.
52. Teachers often eat lunch together.
53. Teachers generally feel free to ask for assistance from other staff.
54 Teachers generally do not try to be unique or different.
55. Teachers emphasize 'work before play'.
56. It is very hard to keep up with your workload.
57. Teachers are often confused about exactly what they are supposed to do.
58. Senior staff are always checking on teachers and supervise them very closely.
59. New approaches to things are rarely tried.
60. The colors and decorations make the school a warm and cheerful place in which to work.

61. The school is quite a lively place.
62. Teachers who differ greatly from the others in the school don't get on well.
63. Senior staff expect far too much from teachers.
64. Teachers are encouraged to learn things even if they are not directly related to the job.
65. Teachers work very hard.
66. You can take it easy and still get your work done.
67. The fringe benefits of the profession are fully explained to teachers.
68. The school administration does not often give in to pressure from teachers.
69. Things tend to stay just about the same.
70. The school is rather drafty at times.

71. It is hard to get teachers to do any extra work.
72. Teachers often talk to each other about their personal problems.
73. Teachers discuss their personal problems with senior staff.
74. Teachers function fairly independently of senior staff.
75. The staff seems to be quite inefficient.
76. There are always deadlines to be met.
77. Rules and policies are constantly changing.
78. Teachers are expected to conform rather strictly to the rules and customs.
79. There is a fresh, novel atmosphere about the school.
80. The furniture is usually well arranged.

81. The work is usually very interesting.
82. Often some teachers make trouble by talking behind the backs of others.
83. Senior staff stand up for their teachers.
84. Senior staff meet with teachers regularly to discuss their work goals.
85. There is a tendency for the staff to come to work late.
86. Teachers often have to work long hours to get their work done.
87. Senior staff and the school administration encourage teachers to be neat and orderly.
88. There are no firm rules about teacher punctuality.
89. Things always seem to be changing.
90. The rooms are well ventilated.